

# Algorithm Engineering

Jens K. Mueller

`jkm@informatik.uni-jena.de`

Department of Mathematics and Computer Science  
Friedrich Schiller University Jena

Monday 26<sup>th</sup> January, 2015

# Vectorization

# Vector Extensions

- ▶ Shift from x87 FP instructions
- ▶ Use chip space to exploit parallelism
- ▶ SSE (128 bit registers)



- ▶ AVX-256 (256 bit registers)



- ▶ ...

## Vector Extensions (cont.)

- ▶ 16 B alignment (for aligned loads)
- ▶ Speed up near vector length
- ▶ Typically used for 32 bit integers, floating point (single/double)
- ▶ Instruction set reference ([Intel Instruction Set Reference](#))
- ▶ Vectorized libraries, assembly code, intrinsics, compiler vectorization

# Vectorizing Compilers

- ▶ `icc -vec`
- ▶ `gcc -ftree-vectorize`

## Difficulties

- ▶ Memory aliasing
- ▶ Unaligned memory access  
Peel off first iterations or use unaligned memory access